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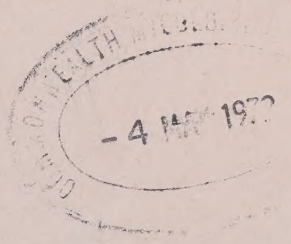

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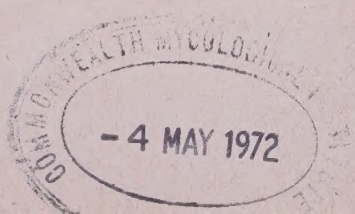

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INTRODUCTION

Verticillium wilt of potatoes was first described in Germany in 1879. Since that time it has been found in most of the temperate regions of the world. In North America, it has been reported as occurring in the northern United States and in all the potato-growing areas of Canada. Under the climatic and soil conditions prevailing in the southern United States, it is of little or no importance.

The fungus causing this wilt (*Verticillium albo-atrum*) remains in the soil for at least two years after an infected crop is grown. It invades the plant through the roots and then progresses into the vines, causing a wilt and a reduction in tuber yield. Crop losses, often considerable in both seed and table potatoes, can be substantially reduced by the practice of control measures described at the end of this bulletin.

SYMPTOMS OF WILT

In spite of differences in weather conditions during growing seasons, the disease usually appears in midsummer. An infected plant first shows a flagging of the lower leaves, after which there is a steady upward development of symptoms until the whole vine is completely wilted. Affected portions of the vines first turn yellow, then become shrivelled and later die. The basal portion of a severely wilted stalk, if split lengthwise, shows a brown discoloration just beneath the surface. A further characteristic of Verticillium wilt is that all vines arising from a single seed-piece do not necessarily become affected. The general appearance of a wilted plant is shown in Figure I.

Other symptoms of the disease appear later in the season. When an infected vine dies, the lower portion of the stem, the roots, and the stolons turn a velvety black due to the complete invasion and overgrowth of these plant parts by the wilt organism. At the same time the above-ground parts present a dull grey sheen as they dry out. No such blackening or greying occurs upon the death of healthy plants. From the foregoing description, Verticillium wilt may be readily identified in potato plantings that have reached full maturity.

Internal stem-end discoloration is a common symptom in many tubers from wilted plants. It appears as a yellowish-brown ring just beneath the stolon attachment, as illustrated in Figure 2.

WAYS OF SPREAD

A consideration of the symptoms described above points to several ways by which the disease may spread.

If the fungus becomes established in the tissue of a tuber, it will be present in some or all of the seed-pieces cut from the tuber and will grow into and infect new plants produced from them.

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Figure 1. Typical appearance of a wilted plant.

Figure 2. Internal stem-end discoloration in a tuber from a wilted plant.

The growing plant may also become infected by spores present on the seed-pieces.

The dead stalks and roots of wilted plants liberate great numbers of fungus spores into the soil and these become a source of infection to a susceptible crop. It has been shown that in some potato-growing areas of the United States, soils may remain infested for several years in the absence of a wilt-susceptible crop.

Healthy seed-stock may contract the disease through contact with contaminated potatoes, sacks, graders, or baskets. Second-hand sacks used as containers for potato sets can be an important source of infection.

The Verticillium wilt fungus attacks a great many plant species. Economic crops, such as raspberries, strawberries, and tomatoes, are very susceptible to wilt and infected stands of these crops will pollute a soil, rendering it unfit for growing potatoes for a period of at least three years.

VARIETAL RESPONSE

Experiments to control infection have shown that practically all the commonly grown potato varieties will contract wilt readily when planted in infected soil. There is, however, a marked variation between varieties in the extent to which the disease is transmitted by their tubers. Inspection records show that Verticillium wilt is of little or no importance in the varieties Green Mountain and Katahdin. Tuber transmission is not an important means of spread in either of these varieties, and serious wilt would not be expected in them under the conditions of a four- to five-year rotation.

Verticillium wilt is a common disease in commercial stands of Chippewa, Irish Cobbler, Sebago, and Kennebec. Tuber transmission occurs readily in these varieties, and the disease may thus be carried over from season to season in successive plantings.

CONTROL MEASURES

Control measures for Verticillium wilt must be based upon the ways by which the disease is spread. There is no practical method of destroying the fungus within the tuber, and such infected tubers will be numerous in plantings that have shown high percentages of wilt during the growing season. Stock that has been rejected on field inspection should be replaced by new seed known to be free of this disease.

Potato stock that has passed field inspection but which has contracted limited amounts of wilt, may be safely planted the following year if the seed tubers are treated with an organic mercury dip. Where such seed is left untreated, high percentages of wilt are often encountered, largely because of the presence of spores on the seed-piece surfaces.

The value of seed treatment in effectively reducing this source of infection has been demonstrated in experiments conducted in Prince Edward Island. For example, tubers of the Irish Cobbler variety were obtained from three different seed sources that showed high percentages of wilt. Half of the seed from each was planted without treatment, and the remainder was treated with Semesan Bel before planting. The treatment consisted of dipping whole or cut tubers in a solution of the chemical, as recommended by the manufacturer. These lots were planted in experimental plots of land known to be free of the wilt organism and comparisons of wilt development and yield were recorded. On the average, this treatment reduced the number of wilted plants from 63 to 26 per cent and increased the yield by 84 bushels per acre. It is evident, therefore, that a considerable measure of wilt control may thus be attained through seed treatment of those varieties that transmit the disease readily through the seed. These include Irish Cobbler, Sebago, Chippewa, and Kennebec.

The problem of dealing with soil infestation arising from the growing of an infected crop can only be successfully met by practising a long rotation that includes crops not susceptible to the wilt. With no susceptible crop on which to multiply, the degree of soil infestation will gradually diminish to mere traces.

The essential points of a successful control program for Verticillium wilt in potatoes may be summarized as follows:

1. Do not plant seed from a severely wilted crop.
2. Protect healthy seed from contamination by using clean containers and storage bins.
3. Treat the seed of susceptible varieties before planting.
4. Practice a long rotation on land where the disease has recently occurred.

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